PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Appellant:	Makoto SHIOMI		
Title:	LIQUID CRYSTAL DISPLAY		
Attorney Docket:	12480-000046/US		

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JUNE 21, 2010

APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 41.37

Sir:

This is an Appeal Brief in response to the Final Office Action mailed September 8, 2009 and the Notice of Panel Decision mailed April 19, 2010. Appellant filed a Notice of Appeal on December 8, 2009. Appellant submits herewith their Brief on Appeal as required by 37 C.F.R. §41.37 along with the appropriate government fees.

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest is Sharp Kabushiki Kaisha.

II. RELATED APPEALS AND INTERFERENCES

No related appeals or interferences are known.

III. STATUS OF CLAIMS

Claims 1-2, 4-8, 10-14 and 16-24 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over 2002/0033789 ("Miyata") in view of U.S. Patent No. 5,027,111 ("Davis"), U.S. Patent No. 5,694,147 ("Gaalema") and further in view of U.S. Patent No. 6,943,768 ("Cavanaugh").[1]

Claims 3, 9 and 15 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over Miyata, Davis, Gaalema, Cavanaugh and further in view of U.S. Patent No. 7,106,287 ("Ham").[2]

Claims 1-24 are being appealed.

IV. STATUS OF AMENDMENTS

No amendments have been filed after the mailing of the Final Office Action on September 8, 2009.

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[1] Final Office Action, pp. 3-15, U.S. App. No. 10/828,471. September 8, 2009.
[2] Id. at 15-16.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A. A GENERAL DISCUSSION OF THE SUBJECT MATTER DESCRIBED IN THE SPECIFICATION TO ASSIST THE BOARD IN UNDERSTANDING EXAMPLE EMBODIMENTS.

1. Background

Liquid crystal displays (LCDs) generally have a slower response speed than Cathode-Ray Tubes (CRTs) and other display devices. In some LCDs, a response is not completed within a rewriting time period corresponding to a conventional frame frequency (e.g., 60 Hz) because of a grayscale level transition. In order to complete these responses within the appropriate time, a driving signal is modulated and driven to facilitate transition from a previous grayscale level to a current grayscale level, thereby improving the response speed.

In one example, a voltage level that is higher than a voltage level indicative of image data D(i, j, k) of a current frame FR(k) is supplied to a pixel to facilitate transition from a previous frame to the current frame. Using this method, a brightness level of a pixel changes more rapidly and comes closer to a brightness level corresponding to image data D(i, j, k) of the current frame FR(k) in a shorter period of time as compared to a brightness level in a case where a voltage level indicative of image data D(i, j, k) of the current frame FR(k) is supplied from the start. This improves the response speed of the LCD even when the response speed of the LC is relatively slow.

The above-described type of LCD facilitates the grayscale level transition from the previous frame to the current frame by correcting image data regarding the current grayscale level of the pixel so that the pixel receives corrected image data rather than the current image data. Unless the grayscale level transition is appropriately facilitated, excess brightness due to over-facilitated grayscale level transition or poor brightness due to insufficiently-facilitated grayscale level transition may occur.

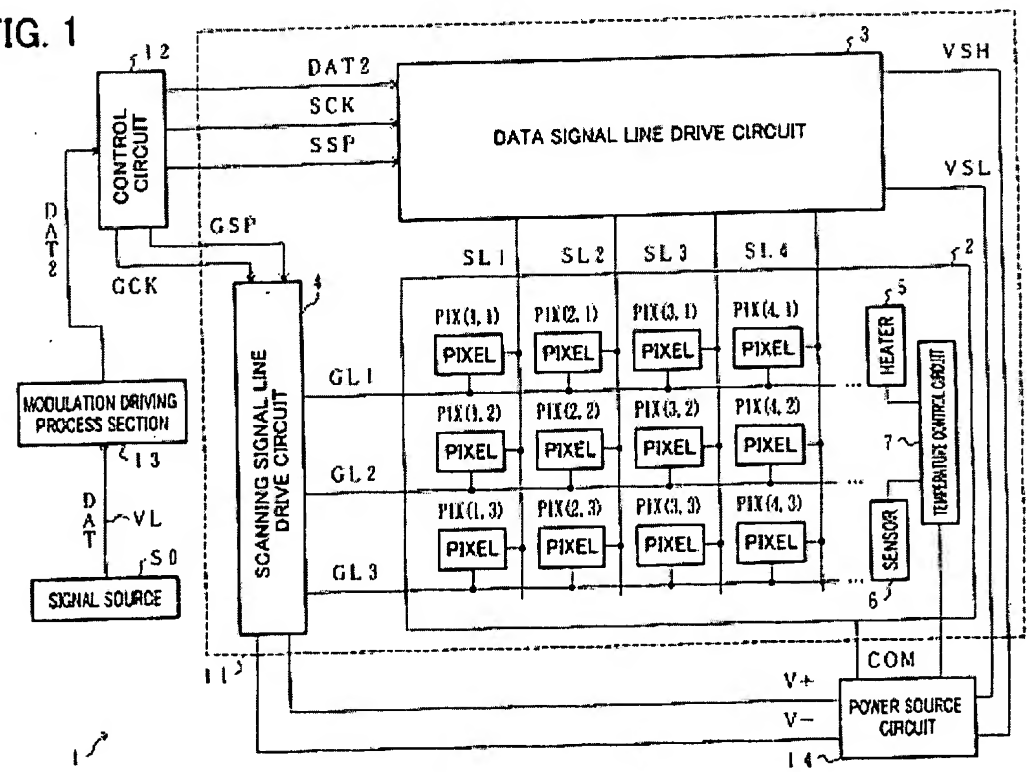
Conventional LCDs utilize a heater to maintain the LC panel at a constant temperature. When using a conventional heater, circuits for estimating a temperature and controlling heating must be provided to precisely control a temperature, which complicates the heater and temperature control circuit for controlling the heater. Furthermore, even with estimation and control circuits, the quantity of heat provided by the heater is dependent on the ambient temperature. For example, when the ambient temperature changes more than anticipated, the temperature control circuit increases a quantity of heat to be significantly larger than a usual quantity in order to counteract the change in ambient temperature. In this case, the attempt to precisely control the temperature may result in an unnecessarily high temperature of the liquid crystal panel due to, for example, mis-estimation.

2. Example Embodiments

Example embodiments provide LCDs, which realize improved response speed while suppressing the degradation of display quality when the ambient temperature changes.

FIG. 1 is a block diagram illustrating a portion of a liquid crystal display according to an example embodiment.

FIG. 1



Referring to FIG. 1, a panel 11 of the LCD 1 includes a pixel array 2, data signal line drive circuit 3, scanning signal line drive circuit 4, heater 5, temperature sensor 6, and temperature control circuit (also referred to as a

heater control means) 7. The pixel array 2 further includes pixels PIX (1, 1) through PIX (n, m) arranged in a matrix configuration.

The heater 5 heats the panel 11, and the temperature sensor 6 senses a temperature of the panel 11. In FIG. 1, the heater 5 is shown away from the pixel array 2. However, as described in more detail with regard to FIG. 7, the heater 5 actually overlaps the pixel array 2 when vertically looking down the panel 11. Accordingly, the heater 5 is configured to heat the entire pixel array 2.

The temperature control circuit 7 controls the heater 5 in such a manner as to cause the temperature of the panel 11 to fall within a temperature range (discussed in more detail below), in accordance with the temperature sensed by the temperature sensor 6.

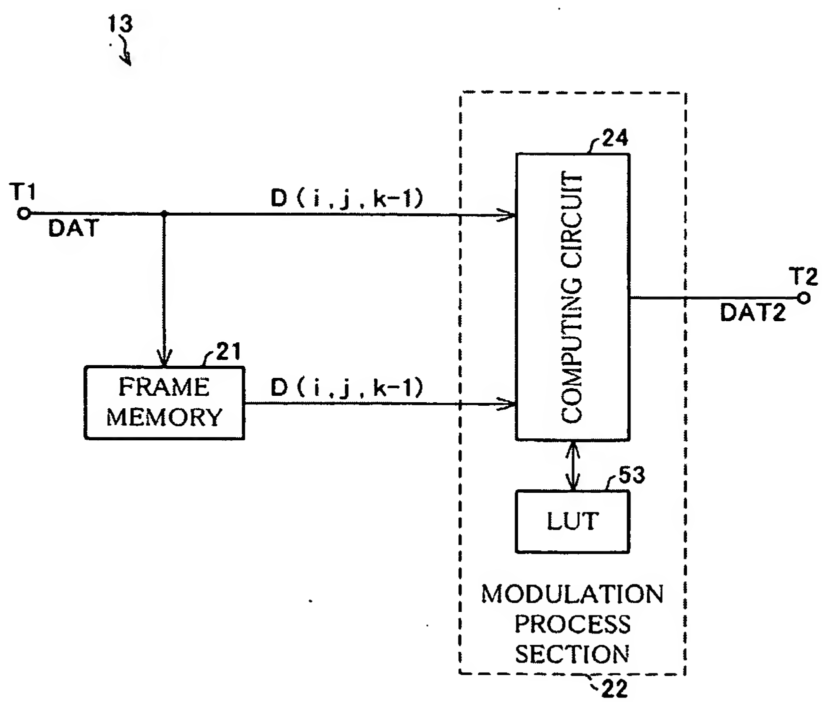
The temperature control circuit 7 of the liquid crystal display 1 uses the heater 5 and temperature sensor 6 to maintain a temperature of the panel 11 to be within ±3°C of a target temperature, irrespective of the ambient temperature. More simply, the temperature control circuit 7 has a target temperature, which is in the range between 48°C and 63°C. When a temperature of the panel 11 exceeds a threshold distance or difference (1°C-1.5°C) from the target temperature, the temperature control circuit 7 stops the heater 5. Meanwhile, when a temperature of the panel 11 falls below a threshold distance or difference (1°C-1.5°C) from the target temperature, the temperature control circuit 7 starts the heater 5. Accordingly, the temperature

of the panel 11 is always kept within ±3°C of the target temperature, irrespective of the ambient temperature.

The LCD 1 further includes a modulation driving process section 13, which modulates an image signal supplied to the control circuit 12 in accordance with the supplied image signal to facilitate the grayscale level transition.

FIG. 3 (shown below) illustrates a portion of the modulation driving process section 13 shown in FIG. 1.

FIG. 3



Referring to FIG. 3, the modulation driving process section 13 includes a frame memory (memory) 21 and a modulation process section 22. The frame

memory 21 stores image data, corresponding to one frame, supplied via an input terminal T1.

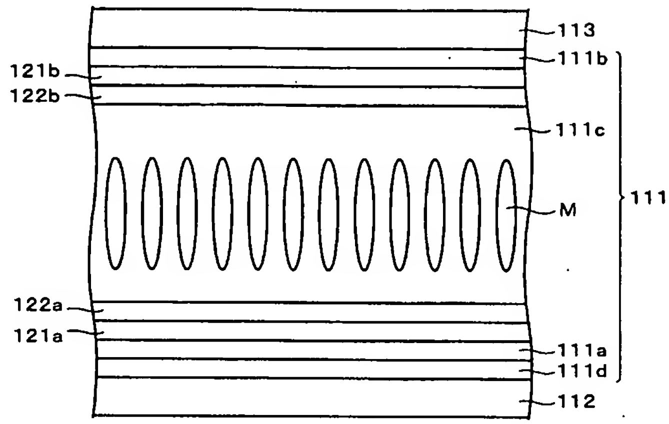
The modulation process section 22 corrects (modulates) the image data D(i, j, k) of the current frame FR(k) to facilitate the grayscale level transition between the previous image data D(i, j, k-1) of the previous frame FR(k-1) and the image data D(i, j, k). The modulation process section 13 outputs corrected (or modulated) image data D2(i, j, k) as corrected image signal DAT2.

In more detail, the modulation process section 22 includes a computing circuit (control means) 24 and a look-up table (LUT) 23. The LUT 23 stores sets of corrected image data corresponding to respective combinations capable of being be input as the image data D(i, j, k) and image data D(i, j, k-1).

The computing circuit (control means) 24 reduces the required storage capacity of the LUT 23. That is to say, the sets of corrected image data stored in the LUT 23 correspond to only some combinations of corrected image data. In example operation, the computing circuit 24 interpolates corrected image data corresponding to each combination stored in the LUT 23, and computes corrected image data D2(i, j, k) corresponding to the combination of the image data D(i, j, k-1) and the current image data D(i, j, k) to output the corrected image data D2(i, j, k).

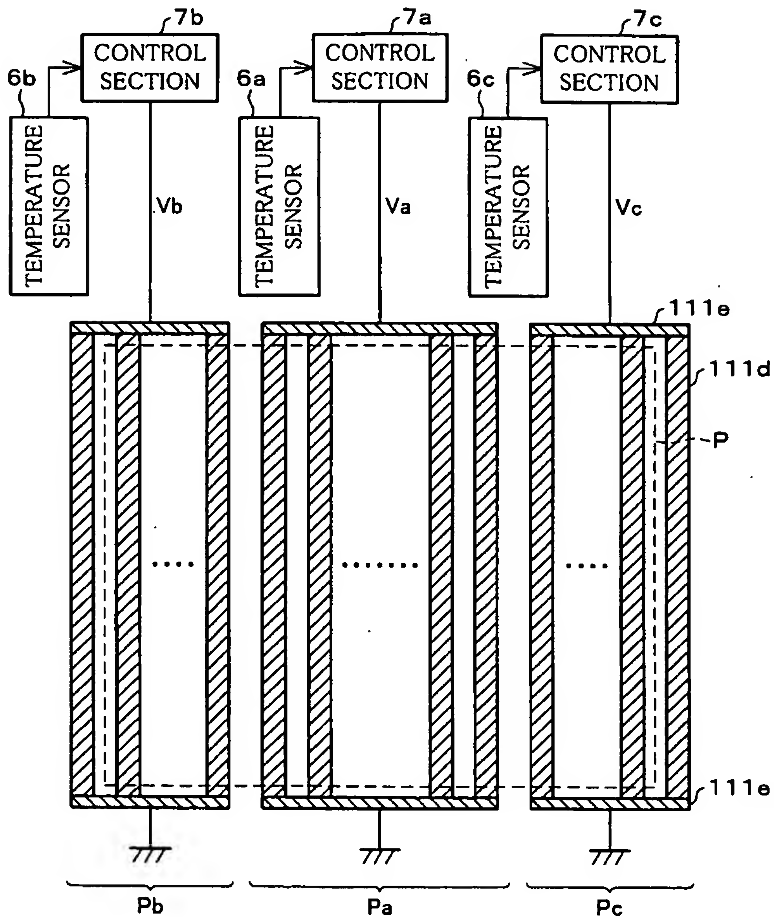
FIG. 4 is a schematic view showing a liquid crystal cell provided in the liquid crystal display.

FIG. 4



Referring to FIG. 4, the heater 5 in the liquid crystal cell 111 is composed of transparent heater electrode 111d formed between the TFT substrate 111a and the polarization plate 112. The heater electrode 111d is described in more detail with regard to FIG. 7

FIG. 7 is a plan view showing an example of the heater 5 shown in FIG. 1. The heater 5 shown in FIG. 7 maintains a temperature of the panel 11 to be substantially identical with a target temperature, irrespective of the change of the ambient temperature.



Referring to FIG. 7, the heater electrodes 111d are formed as linear bands aligned to be in parallel with each other and in parallel with short sides of the panel 11. The heater electrodes 111d and gaps there between cover the entire display screen P of the panel 11 when looking vertically down the panel 11.

In the example embodiment shown in FIG. 7, the surface of the panel 11 is divided into at least three areas Pa-Pc. The heater electrodes 111d in the central area Pa of the panel 11 are electrically connected to each other via

metal electrodes 111e provided at respective ends of each heater electrode 111d.

Similarly, in each of the peripheral areas Pb and Pc of the panel 11, the heater electrodes 111d are electrically connected to each other via metal electrodes 111e provided at respective ends of each heater electrode 111d.

The temperature control circuit 7 also includes control sections 7a-7c corresponding to the respective areas Pa-Pc. The control sections 7b and 7c supply a voltage higher than a voltage supplied to the heater electrodes 111d of the central area Pa to the heater electrodes 111d of the peripheral areas Pb and Pc. As a result, the entirety of the panel 11 is kept at a substantially uniform temperature, irrespective of the ambient temperature.

Still referring to FIG. 7, temperature sensors 6a-6c are provided for measuring temperatures of the respective areas Pa-Pc. On the one hand, when the result of measurement by each temperature sensor 6a-6c exceeds a first threshold value, the corresponding control section 7a-7c stops the supply of voltage to the heater electrodes 111d. On the other hand, when the result of measurement by each temperature sensor 6a-6c falls below a second threshold value, the corresponding control section 7a-7c starts to supply a voltage to the heater electrodes 111d.

B. A CONCISE EXPLANATION OF THE SUBJECT MATTER SET FORTH IN EACH INDEPENDENT CLAIM AND EACH DEPENDENT CLAIM ARGUED SEPARATELY.

The following is a concise explanation of the subject matter set forth in each independent and dependent claim argued separately as required by 37 C.F.R. § 41.37. It is noted, however, that the references to example embodiments described in the specification are for the example purposes only.

1. Claim 1

Claim 1 is directed to a liquid crystal display (FIG. 1; 1), comprising: a memory (FIG. 3; 21) storing, until a next time, current data D(i,j,k) indicating current brightness of each pixel (PIX(n,m)) provided in a liquid crystal panel (FIG. 1; 11);[3] a look-up table (FIG. 3; 53) precedently storing (i) combinations of previous data D(i,j,k-1) and the current data D(i,j,k), the combinations having possibilities to be inputted, and (ii) output signals corresponding to the respective combinations;[4] control means (FIG. 3; 22, 24) for outputting an output signal (DAT2) as corrected current data D2(i,j,k) in order to facilitate grayscale transition from a previous time to a current time, by reading out, from the look-up table, data corresponding to a combination of previous data read out from the memory and current data, and outputting that data or that data after being interpolated, instead of the current data;[5] a heater (FIG. 1; 5

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[3] See, e.g., Appellants' Specification ("Spec.") at p. 6, ll. 14-17; p. 26, ll. 2-6; p. 43, ll. 10-13.
[4] See, e.g., *Id.* at p. 6, ll. 17-20; p. 27, l. 1 – p. 28, l. 4; p. 35, l. 12 – p. 36, l. 2; p. 40, ll. 8 – 25; p. 43, ll. 13-17.
[5] See, e.g., *Id.* at p. 6, l. 20 – p. 7, l. 3; p. 26, l. 7 – p. 28, l. 4; p. 28, l. 22 – p. 29, l. 8; p. 43, ll. 17-24.

and FIG. 7) heating the liquid crystal panel, the heater including a plurality of heater electrodes (FIG. 7; 111d), each of the plurality of heater electrodes being formed as a linear band (FIG. 7) aligned to be in parallel with a side of the liquid crystal panel;[6] and heater control means (FIG. 1; 7 and FIG. 7) for controlling start and stop of heating by the heater, in such a manner as to keep a sensed temperature of the liquid crystal panel to be not more than ±3°C of a predetermined target temperature which is within a range between 33°C and 63°C, the sensed temperature of the liquid crystal panel being determined by sensing a temperature of a plurality of separate sections (FIG. 7; Pa, Pb, Pc) of the liquid crystal panel.[7]

2. Claim 3

According to claim 3, the look-up table is arranged so as to correspond to the target temperature.[8]

3. Claim 7

Claim 7 is directed to a liquid crystal display (FIG. 1; 1), comprising: a memory (FIG. 3; 21) storing, until a next time, current data indicating current brightness of each pixel (PIX(n,m)) provided in a liquid crystal panel (FIG. 1; 11);[9] a look-up table (FIG. 3; 53) precedently storing (i) combinations of

[6] See, e.g., *Id.* p. 7, ll. 2-8; p. 29, l. 9 – p. 30, l. 9; p. 43, l. 25 – 44, l. 1.
[7] See, e.g., *Id.* p. 7, l. 3 – p. 9, l. 9; p. 11, ll. 21-22; p. 28, ll. 5-21; p. 30, l. 10 – p. 33, l. 17; p. 37, l. 7 - p. 38, l. 13; p. 44, ll. 1-6.
[8] *Id.* at FIGS. 9-12; p. 35, ll. 12-21; p. 40, l. 8 – p. 42, l. 13.
[9] See, e.g., *Id.* at p. 6, ll. 14-17; p. 26, ll. 2-6; p. 43, ll. 10-13; p. 46, ll. 15-17.

previous data (D(i,j,k-1)) and the current data (D(i,j,k)), the combinations having possibilities to be inputted, and (ii) output signals corresponding to the respective combinations;[10] control means (FIG. 3; 22, 24) for outputting an output signal (DAT2) as corrected current data (D2(i,j,k)) in order to facilitate grayscale transition from a previous time to a current time, by reading out, from the look-up table, data corresponding to a combination of previous data read out from the memory and current data, and outputting that data or that data after being interpolated, instead of the current data;[11] a heater (FIG. 1; 5 and FIG. 7) heating the liquid crystal panel, the heater including a plurality of heater electrodes (FIG. 7; 111d), each of the plurality of heater electrodes being formed as a linear band (FIG. 7) aligned to be in parallel with a side of the liquid crystal panel;[12] and heater control means (FIG. 1; 7 and FIG. 7) for controlling the heater so as to either stop the heating by the heater when a sensed temperature of the liquid crystal panel exceeds a threshold value which is 1°C through 1.5°C higher than a target temperature, or start the heating by the heater when the sensed temperature of the liquid crystal panel goes below a threshold value which is 1°C through 1.5°C lower than the target temperature, the target temperature being determined in advance to be in a range between 33°C and 63°C; wherein the sensed temperature of the liquid

[10] See, e.g., *Id.* at p. 6, ll. 17-20; p. 27, l. 1 – p. 28, l. 4; p. 35, l. 12 – p. 36, l. 2; p. 40, ll. 8 – 25; p. 43, ll. 13-17; p. 46, ll. 17-21.
[11] See, e.g., *Id.* at p. 6, l. 20 – p. 7, l. 3; p. 26, l. 7 – p. 28, l. 4; p. 28, l. 22 – p. 29, l. 8; p. 43, ll. 17-24; p. 46, l. 21 – p. 47, l. 3.
[12] See, e.g., *Id.* p. 7, ll. 2-8; p. 29, l. 9 – p. 30, l. 9; p. 43, l. 25 – 44, l. 1; p. 47, ll. 4-5.

crystal panel is determined by sensing a temperature of a plurality of separate sections (FIG. 7; Pa, Pb, Pc) of the liquid crystal panel.[13]

4. Claim 9

The liquid crystal display as defined in claim 7, wherein, the look-up table is arranged so as to correspond to the target temperature.[14]

5. Claim 13

Claim 13 is directed to a liquid crystal display (FIG. 1; 1), comprising: a memory (FIG. 3; 21) storing, until a next time, current data (D(i,j,k)) indicating current brightness of each pixel (PIX(n,m)) provided in a liquid crystal panel (FIG. 1; 11);[15] a look-up table (FIG. 3; 53) precedently storing (i) combinations of previous data (D(i,j,k-1)) and the current data (D(i,j,k)), the combinations having possibilities to be inputted, and (ii) output signals corresponding to the respective combinations;[16] control means (FIG. 3; 22, 24) for outputting an output signal (DAT2) as corrected current data (D2(i,j,k)) in order to facilitate grayscale transition from a previous time to a current time, by reading out, from the look-up table, data corresponding to a combination of previous data read out from the memory and current data, and outputting that data or that

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[13] See, e.g., *Id.* p. 7, l. 3 – p. 9, l. 9; p. 11, ll. 21-22; p. 28, ll. 5-21; p. 30, l. 10 – p. 33, l. 17; p. 37, l. 7 - p. 38, l. 13; p. 44, ll. 1-6; p. 45, l. 12 – p. 46, l. 13; p. 47, ll. 5-14.
[14] *Id.* at FIGS. 9-12; p. 35, ll. 12-21; p. 40, l. 8 – p. 42, l. 13.
[15] See, e.g., *Id.* at p. 6, ll. 14-17; p. 26, ll. 2-6; p. 43, ll. 10-13; p. 48, ll. 8-10.
[16] See, e.g., *Id.* at p. 6, ll. 17-20; p. 27, l. 1 – p. 28, l. 4; p. 35, l. 12 – p. 36, l. 2; p. 40, ll. 8 – 25; p. 43, ll. 13-17; p. 48, ll. 10-14.

data after being interpolated, instead of the current data;[17] a heater (FIG. 1; 5 and FIG. 7) heating the liquid crystal panel, the heater including a plurality of heater electrodes (FIG. 7; 111d), each of the plurality of heater electrodes being formed as a linear band (FIG. 7) aligned to be in parallel with a side of the liquid crystal panel;[18] and heater control means (FIG. 1; 7 and FIG. 7) for controlling start and stop of heating by the heater, in such a manner as to keep a difference between a sensed temperature of the liquid crystal panel and a target temperature to be not more than a predetermined threshold value, the target temperature being a temperature at which, by facilitating the grayscale transition by the control means, each pixel is virtually able to reach a desired grayscale level in every grayscale level transition, the threshold value being set in such a manner as to keep a difference between a grayscale level at which a pixel reaches as a result of the grayscale level correction by the control means and a target grayscale level to be within an allowable range; wherein the sensed temperature of the liquid crystal panel is determined by sensing a temperature of a plurality of separate sections of the liquid crystal panel.[19]

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[17] See, e.g., *Id.* at p. 6, l. 20 – p. 7, l. 3; p. 26, l. 7 – p. 28, l. 4; p. 28, l. 22 – p. 29, l. 8; p. 43, ll. 17-24; p. 48, ll. 14-21.
[18] See, e.g., *Id.* p. 7, ll. 2-8; p. 29, l. 9 – p. 30, l. 9; p. 43, l. 25 – 44, l. 1; p. 48, l. 22-23.
[19] See, e.g., *Id.* p. 7, l. 3 – p. 9, l. 9; p. 11, ll. 21-22; p. 28, ll. 5-21; p. 30, l. 10 – p. 33, l. 17; p. 37, l. 7 - p. 38, l. 13; p. 44, ll. 1-6; p. 45, l. 12 – p. 46, l. 13; p. 48, l. 23 – p. 50, l. 1.

6. Claim 15

According to claim 15, the look-up table is arranged so as to correspond to the target temperature.[20]

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant requests the Board review and reverse the final rejection of claims 1-2, 4-8, 10-14 and 16-24 under 35 U.S.C. § 103(a) as unpatentable over 2002/0033789 ("Miyata") in view of U.S. Patent No. 5,027,111 ("Davis"), U.S. Patent No. 5,694,147 ("Gaalema") and further in view of U.S. Patent No. 6,943,768 ("Cavanaugh").

Appellant also requests the Board review and reverse the final rejection of claims 3, 9 and 15 under 35 U.S.C. § 103(a) as unpatentable over Miyata, Davis, Gaalema, Cavanaugh and further in view of U.S. Patent No. 7,106,287 ("Ham").

Claims 1, 2, 4-8, 10-14, 16-23 and 24 stand and fall together.

Claims 3, 9 and 15 stand and fall together.

[20] *Id.* at FIGS. 9-12; p. 35, ll. 12-21; p. 40, l. 8 – p. 42, l. 13.

VII. ARGUMENT

A. *MIYATA IN VIEW OF DAVIS, GAALEMA AND FURTHER IN VIEW OF CAVANAUGH FAILS TO RENDER CLAIMS 1, 7 AND 13 OBVIOUS BECAUSE THE COMBINATION OF REFERENCES FAILS TO DISCLOSE OR SUGGEST AT LEAST A HEATER INCLUDING A PLURALITY OF HEATER ELECTRODES, EACH OF THE PLURALITY OF HEATER ELECTRODES BEING FORMED AS A LINEAR BAND ALIGNED TO BE IN PARALLEL WITH A SIDE OF THE LIQUID CRYSTAL PANEL.*

A *prima facie* case of obviousness requires a suggestion of all limitations in a claim.[21] Miyata in view of Davis, Gaalema and further in view of Cavanaugh fails to disclose or fairly suggest at least a heater "including a plurality of heater electrodes, each of the plurality of heater electrodes being formed as a linear band aligned to be in parallel with a side of the liquid crystal display" as required by claim 1, for example. Therefore, the combination of references fails to render claim 1 obvious.[22]

At page 5, the Final Office Action correctly recognizes that Miyata, Davis and Gaalema, taken singly or in combination, fail to disclose or fairly suggest at least a heater "including a plurality of heater electrodes, each of the plurality of heater electrodes being formed as a linear band aligned to be in parallel with a side of the liquid crystal panel" as required by claim 1. To make up for this deficiency, page 5 of the Final Office Action directs Appellant's attention to Cavanaugh. Specifically, page 5 of the Final Office Action directs Appellant's

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21 *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) (*citing In re Royka*, 490 F.2d 981, 985 (CCPA 1974)), see also, Ex parte Wada and Murphy (BPAI Jan. 2008).
22 *Id.*

attention to column 9, lines 26-32 and 49-67 of Cavanaugh. Appellant disagrees.

FIG. 7 of the instant application (a portion of which is reproduced below) shows an example embodiment of a plurality of heater electrodes 111d, wherein each heater electrode 111d is formed as a *linear band to be in parallel with a side of the liquid crystal panel P.*

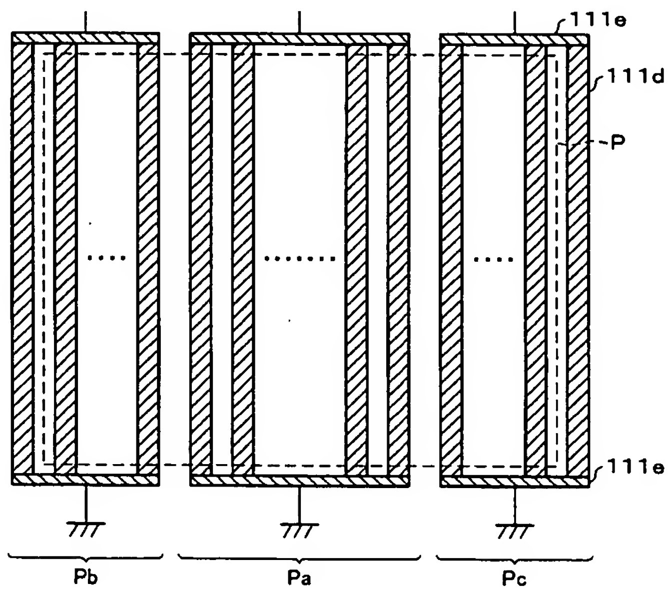
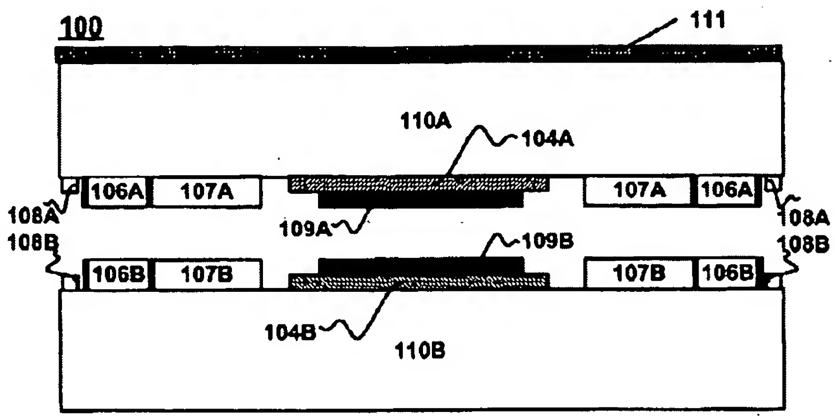


FIG. 7 of the instant application

Cavanaugh discloses a thermal control system for a liquid crystal cell. FIG. 4C of Cavanaugh (shown below) shows a cross-sectional view of an embodiment of the liquid crystal cell.

FIGURE 4C



Referring to FIG. 4C, a first liquid crystal cell platform 100 has a first glass substrate 110A arranged opposite to a second glass substrate 110B. The first substrate 110A includes a transparent conductive electrode layer 104A, a liquid crystal alignment layer 109A, a metal gasket element layer 106A, a spacer element layer 107A and an integrated heater/temperature sensor element 108A.

The second substrate 110B includes a transparent conductive electrode layer 104B, a liquid crystal alignment layer 104B, metal gasket element layer 106B, a spacer element layer 107B and an integrated heater/temperature sensor layer 108B.[23]

According to lines 47-61 in column 9 of Cavanaugh, a switch 407 selectively engages the integrated heater/temperature sensor element 108 in a sense or heat mode. In the heat mode, the switch 407 is OFF so that a voltage potential is applied to operate the device 108 as a heater.

[23] See, Cavanaugh at col.6, ll. 22-35.

FIG. 10A of Cavanaugh (reproduced below) is a top view of an embodiment of a liquid crystal cell. FIG. 10B (also reproduced below) is a perspective view of the liquid crystal cell shown in FIG. 10A.

In FIGS. 10A and 10B, 502 and 502' represent electrical contact pads of the liquid crystal heater/temperature sensor 108 shown in FIG. 4C. Indeed, at lines 26-32 in column 9, Cavanaugh states with reference to FIG. 10B:

> [An] access surface 113 of FIG. 10B [...] provides access to [...] the underlying liquid crystal heater/temperature sensor element electrical contact pads 502 and 502', as well as to the liquid crystal fill port 115.

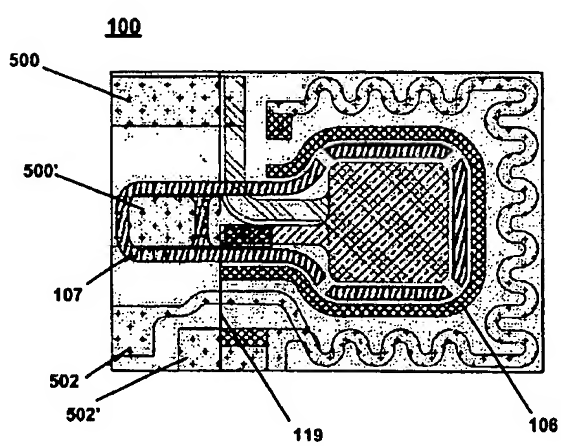


FIG. 10A of Cavanaugh

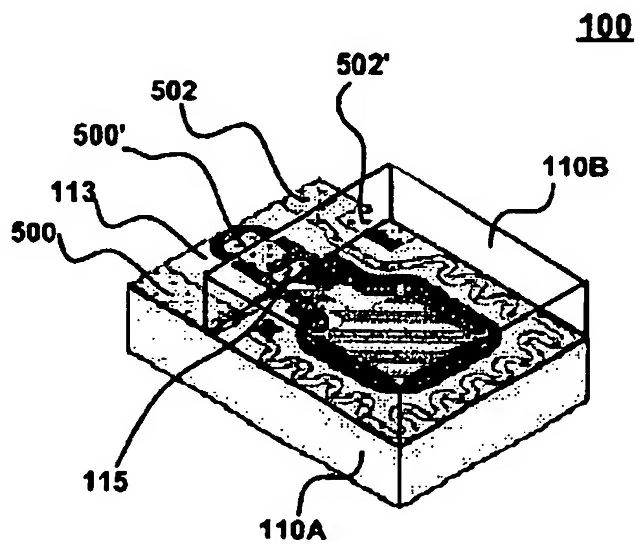


FIG. 10B of Cavanaugh

As is clear from inspection of FIGS. 10A and 10B, the heater/temperature sensor electrodes 502 and 502', and thus the heater/temperature sensors 108A and 108B, have a *winding shape*. By

contrast, in claim 1 the plurality of heater electrodes <u>are formed as a linear band to be in parallel with a side of the liquid crystal panel.</u>

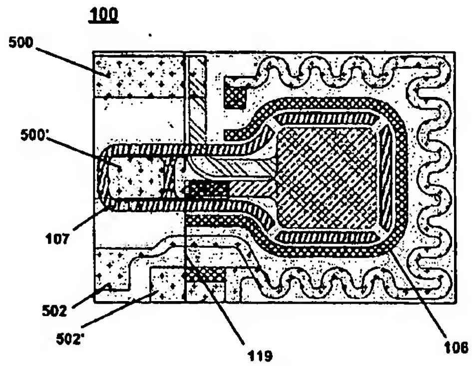


FIG. 10A of Cavanaugh

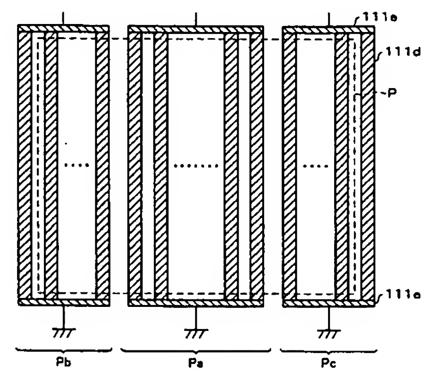


FIG. 7 of the application

Indeed, when comparing FIG. 10A of Cavanaugh and FIG. 7 of this application, one can appreciate that the heater/temperature sensor elements in Cavanaugh are <u>not</u> formed as *linear bands aligned to be in parallel with a side of the liquid crystal panel* as is the case with the heater electrodes 111d in FIG. 7 of the instant application. Therefore, the electrode contact pads 502/502' (and consequently the heater/temperature sensor elements 108A/108B) do not constitute a plurality of heater electrodes formed as <u>linear bands aligned to be in parallel with a side of the liquid crystal panel</u> as required to meet the limitations of claim 1. And, Cavanaugh does not disclose or suggest the "heater" of claim 1.

Moving forward, at page 2, the Final Office Action states in-part:

> The cells of a liquid display are typically aligned to form a linear band and are also parallel with a side of the liquid crystal panel. By using the temperature sensor/heater, incorporated into a cell of a liquid crystal, of Cavanaugh, the heater electrodes would then

form a linear band which would be in parallel with a side of the liquid crystal panel.

Appellant disagrees.

As the Board will appreciate, even assuming *arguendo* that the liquid crystal cell 100 of Cavanaugh was used to form a liquid crystal panel (which Appellant does not admit is the case), the plurality of heater/temperature sensor electrodes in Cavanaugh (e.g., 502 and 502' shown in FIG. 10A) would not result in a plurality of heater electrodes formed in the manner required by claim 1; that is, such that each of the plurality of heater electrodes are "formed as a linear band aligned to be in parallel with a side of the liquid crystal panel." This is at least because the contact pads 502 and 502' have a *winding shape*, which is not linear. Thus, even if the liquid crystal cell 100 was used to form a liquid crystal panel, the resultant heater electrodes still have a *winding shape*, and thus, would not be formed as linear bands.

For at least the foregoing reasons, Cavanaugh fails to disclose or fairly suggest at least a plurality of heater electrodes formed such that each of the plurality of heater electrodes are "formed as a linear band aligned to be in parallel with a side of the liquid crystal panel" as required by claim 1.

Because none of Miyata, Davis, Gaalema or Cavanaugh discloses or suggests a plurality of heater electrodes formed in the manner recited in claim 1; that is, such that each of the plurality of heater electrodes are "formed as a linear band aligned to be in parallel with a side of the liquid crystal panel" as

required by claim 1, the references, even in combination, fail to render claim 1 obvious.[24]

Claim 7 requires, *inter alia*, "a heater [...] including a plurality of heater electrodes, each of the plurality of heater electrodes being formed as a linear band aligned to be in parallel with a side of the liquid crystal panel," and thus, is not rendered obvious by Miyata in view of Davis, Gaalema and further in view of Cavanaugh for at least the reasons set forth above with regard to claim 1.[25]

Claim 13 requires, *inter alia*, "a heater [...] including a plurality of heater electrodes, each of the plurality of heater electrodes being formed as a linear band aligned to be in parallel with a side of the liquid crystal panel," and thus, is also not rendered obvious by Miyata in view of Davis, Gaalema and further in view of Cavanaugh for at least the reasons set forth above with regard to claim 1.[26]

Claims 2, 4-6, 8, 10-12, 14, and 16-24 are not rendered obvious by Miyata in view of Davis, Gaalema and further in view of Cavanaugh at least by virtue of their dependency from claims 1, 7 and 13.[27]

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[24] *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d at 1342, see also, Ex parte Wada and Murphy.
[25] *Id.*
[26] *Id.*
[27] *Id.*

B. MIYATA IN VIEW OF DAVIS, GAALEMA AND FURTHER IN VIEW OF CAVANAUGH FAILS TO RENDER CLAIM 1 OBVIOUS BECAUSE THE COMBINATION OF REFERENCES FAILS TO DISCLOSE OR SUGGEST AT LEAST A HEATER CONTROL MEANS FOR AT LEAST CONTROLLING START AND STOP OF HEATING BY THE HEATER SUCH THAT A TEMPERATURE OF THE LIQUID CRYSTAL PANEL IS NOT MORE THAN ± 3°C OF A PREDETERMINED TARGET TEMPERATURE.

Claim 1 is also not rendered obvious because Miyata in view of Davis, Gaalema and further in view of Cavanaugh fails to disclose or fairly suggest at least "controlling start and stop of heating by the heater such that "a temperature of the liquid crystal panel" is "*not more than ± 3°C of a predetermined target temperature*" as required by claim 1.

At page 4, the Final Office Action correctly recognizes that neither Miyata nor Davis discloses or fairly suggests at least controlling start and stop of heating by the heater such that "a temperature of the liquid crystal panel" is "*not more than ± 3°C of a predetermined target temperature*" as required by claim 1. The Final Office Action, at page 4, relies upon Gaalema to make up for this deficiency. Appellant disagrees.

According to Gaalema, when an ambient temperature reaches a certain preselected level (e.g., target temperature of 40°), differential amplifier 40 has no output and the heating arrangement 24 is not turned on. However, as the ambient temperature decreases below 40°, the output from differential amplifier 40 increases thereby activating the control heating arrangement 24.

When activated, the heating arrangement 24 heats the liquid crystal material 14 disposed over integrated circuit substrate 12.

In Gaalema, both the sensed temperature and the 40° threshold temperature refer to ambient temperatures, rather than "a temperature of the liquid crystal panel" itself as required by claim 1. Indeed, the ambient temperature is not the same as a temperature of the liquid crystal panel.

Moreover, Gaalema is silent with regard to controlling start and stop of heating by the heater such that "a temperature of the liquid crystal panel," is "*not more than ±3°C of a predetermined target temperature*" as required by claim 1.

Furthermore, according to column 5, line 56 – column 6, line 6 of Gaalema, when voltage is applied to sensing arrangement 26, the Wheatstone bridge formed by resistors 32, 34, 36, and 28 causes the voltages at nodes 1 and 2 to vary depending on the resistances of the temperature-dependent resistors 34 and 36. Gaalema discloses a threshold value of 40°C and temperature dependency, but fails to disclose or suggest any temperature range for the liquid crystal panel. Accordingly, Gaalema fails to disclose or fairly suggest a "heater control means for controlling start and stop of heating by the heater, in such a manner as to keep a temperature of the liquid crystal panel to be not more than ±3°C of a predetermined target temperature which is *within a range between 33°C and 63°C*" as required by claim 1.

Cavanaugh also fails to disclose or suggest at least a "heater control means for controlling start and stop of heating by the heater, in such a manner as to keep a temperature of the liquid crystal panel to be not more than ±3°C of a predetermined target temperature which is *within a range between 33°C and 63°C*" as required by claim 1.

In response to Appellant's argument that Ham fails to disclose a look-up table arranged so as to correspond to the target temperature, the July 11, 2008 Office Action states at page 14:

> The sensed temperature is going to correspond to the target temperature because the LCD panel is to be maintained at the target temperature. Therefore, the look-up table will be arranged to correspond to the target temperature since the values would be specific to that temperature.

But, Ham does not disclose that the look-up tables 64a – 64n "arranged so as to correspond to the target temperature," as required by claim 3. The statement in the July 11, 2008 Office Action that "[the] sensed temperature is going to correspond to the target temperature because the LCD panel is to be maintained at the target temperature," and thus, "the look-up table will be arranged to correspond to the target temperature," is merely conclusory, without rational explanation. Indeed, Ham does not disclose any such arrangement of the look-up tables 64a-64n.

Appellant respectfully submit that Ham's look-up tables 64a - 64n, at most, store modulating data for each temperature interval within a temperature range and receive the most significant bits of source data. This

does not, however, constitute a look-up table, "arranged so as to correspond to the target temperature," which is a predetermined target temperature "within a range between 33°C and 63°C," as required by claim 3, for example. The switch 65 of Ham merely selects modulating data from one of a plurality of look-up tables 64a-64n based on temperature. Ham does not disclose or suggest that the look-up tables are arranged so as to correspond to any target temperature for an LCD.

Because none of Miyata, Davis, Gaalema or Cavanaugh discloses or suggests the above-described feature of claim 1, the references, even in combination, fail to render claim 1 obvious.[28]

Claims 2, 4-6, 23 and 24 are not rendered obvious by Miyata in view of Davis, Gaalema and further in view of Cavanaugh at least by virtue of their dependency from claim 1.[29]

C. A PRIMA FACIE CASE OF OBVIOUSNESS HAS NOT BEEN ESTABLISHED BECAUSE THE REJECTION OF CLAIM 1 AS OBVIOUS OVER MIYATA IN VIEW OF DAVIS, GAALEMA AND FURTHER IN VIEW OF CAVANAUGH LACKS THE REQUISITE ARTICULATED REASONING WITH SOME RATIONAL UNDERPINNING TO SUPPORT THE LEGAL CONCLUSION OF OBVIOUSNESS.

According to *KSR Int'l Co. v. Teleflex Inc.*, in order for Miyata in view of Davis, Gaalema and further in view of Cavanaugh to forbid issuance of claim 1, the differences between the claim 1 and the prior art must be such that the

[28] *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d at 1342, see also, Ex parte Wada and Murphy.
[29] *Id.*

claimed subject matter as a whole would have been obvious to a person having ordinary skill in the relevant art at the time the invention was made.[30] Moreover, rejections on obviousness grounds must be accompanied by some "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness[;]" obviousness rejections cannot be sustained by mere conclusory statements.[31]

In the present case, in combining Cavanaugh with Miyata, Davis and Gaalema, the Final Office Action states:

> It would have been obvious at the time of invention to modify Miyata, Davis and Gaalema with the teachings of Cavanaugh, liquid crystal cell with temperature sensor and heating element, because it would allow the cell to be kept at a constant temperature (col. 5, lines 7-12).

The reasons set forth above do not, however, provide a rational underpinning as to why a person having ordinary skill in the art at the time of the invention would have modified the teachings of Miyata, Davis, Gaalema and/or Cavanaugh to include a plurality of heater electrodes, wherein each heater electrode is "formed as a linear band aligned to be in parallel with a side of the liquid crystal panel" as required to meet the limitations of claim 1. Indeed, the particular configuration of heater electrodes required by claim 1 is not disclosed or suggested by the cited art, and there is no suggestion that this

[30] 550 U.S. 398, 406 (2007).
[31] *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), *cited with approval in KSR*, 550 U.S. at 418.

particular configuration was known to one of ordinary skill in the art at the time of the invention.

While column 5, lines 7-12 does state that the invention of Cavanaugh may generally keep a cell at a constant temperature, Cavanaugh does not provide any disclosure as to why one of ordinary skill would have found the particular configuration of each of a plurality of heater electrodes (i.e., "formed as a <u>linear band aligned to be in parallel with a side of the liquid crystal panel</u>") obvious at the time of the invention.

Because the Examiner has not provided the requisite rational underpinning to combine Miyata, Davis, Gaalema and Cavanaugh, a proper *prima facie* case of obviousness has not been established. For at least this reason, Appellant requests the § 103(a) rejection of claim 1 be reversed.

Appellant requests the Board also overturn the rejection of claims 7 and 13 under 35 U.S.C. § 103(a) for at least the reasons set forth above with regard to claim 1.

Appellant requests the Board overturn the rejection of claims 2, 4-6, 8, - 10-12, 14 and 16-24 at least by virtue of their dependency from claims 1, 7 or 13.

D. MIYATA IN VIEW OF GAALEMA, DAVIS, CAVANAUGH AND FUTHER IN VIEW OF HAM FAILS TO RENDER CLAIMS 3, 9 AND 15 OBVIOUS BECAUSE THE COMBINATION OF REFERENCES FAILS TO DISCLOSE OR SUGGEST AT LEAST "WHEREIN, THE LOOK-UP TABLE IS ARRANGED SO AS TO CORRESPOND TO THE TARGET TEMPERATURE."

Claims 3, 9 and 15 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over Miyata in view of Davis, Gaalema, Cavanaugh and further in view of U.S. Patent No. 7,106,287 ("Ham").

Initially, even assuming *arguendo* that Ham could be combined with Miyata, Davis, Gaalema and/or Cavanaugh (which Appellant does not admit), the resultant combination still fails to render even claims 3, 9 and 15 obvious because Ham suffers from at least the same above-discussed deficiencies as Miyata, Davis, Gaalema and Cavanaugh with respect to claims 1, 7 and 13. Therefore, even in combination, Miyata in view of Davis, Gaalema, Cavanaugh and further in view of Ham fail to render claims 3, 9, and/or 15 obvious.

Moving forward, Ham fails to disclose a look-up table arranged so as to correspond to the target temperature as required by claim 3, for example.

At page 15, the Final Office Action states that neither Miyata, Davis, Gaalema nor Cavanaugh discloses or fairly suggests the features of claim 3. Page 16 of the Final Office Action relies upon column 6, lines 44-54 of Ham to disclose this feature. Appellant disagrees.

According to column 6, lines 44-54 of Ham, a data modulator 52a includes look-up tables 64a to 64n. The look-up tables 64a to 64n store

modulating data for each temperature interval within a temperature range and receive the most significant bits of source data. A switch 65 selects modulating data from one of the look-up tables 64a to 64n in accordance with a sensed temperature from the liquid crystal display panel 57. Ham does not, however, disclose a look-up table, "arranged so as to correspond to the target temperature" as required by claim 3, for example. By contrast, the switch 65 of Ham merely selects modulating data from one of a plurality of look-up tables 64a-64n based on sensed temperature. Ham does not disclose or suggest that the arrangement of these look-up tables corresponds to any *target* temperature.

In response to the above-argument, at page 14 the July 11, 2008 Final Office Action states:

> The sensed temperature is going to correspond to the target temperature because the LCD panel is to be maintained at the target temperature. Therefore, the look-up table will be arranged to correspond to the target temperature since the values would be specific to that temperature.

But, Ham does not disclose that the look-up tables 64a – 64n "arranged so as to correspond to the target temperature," as required by claim 3. The Examiner's statement that "[the] sensed temperature is going to correspond to the target temperature because the LCD panel is to be maintained at the target temperature," and thus, "the look-up table will be arranged to correspond to the target temperature," is conclusory, without rational explanation.

Appellant fails to understand how Ham's disclosure of look-up tables 64a - 64n that, at most, store modulating data for each temperature interval within

a temperature range and receive the most significant bits of source data, constitutes a look-up table "arranged so as to correspond to the target temperature," which is a predetermined target temperature "within a range between 33°C and 63°C" as required to meet the limitations of claim 3, for example. The switch 65 of Ham merely selects modulating data from one of a plurality of look-up tables 64a-64n based on temperature. Ham does not disclose or suggest that the arrangement of these look-up tables corresponds to any target temperature for an LCD.

For at least the foregoing reasons, a proper *prima facie* case of obviousness for rejecting claim 3 has not been established. Therefore, Appellant requests the Board overturn the rejection of claim 3 under 35 U.S.C. § 103(a).

Appellant also request the Board overturn the rejection of claims 9 and 15 under 35 U.S.C. § 103 for at the reasons set forth above with regard to claim 3.

VIII. CLAIMS APPENDIX

An appendix containing a copy of the claims involved in this Appeal are attached to the end of this document.

IX. EVIDENCE APPENDIX

An appendix containing copies of any evidence submitted pursuant to §§ 1.130, 1.131, or 1.132 of this title or of any other evidence entered by the examiner and relied upon by appellant in the appeal, along with a statement setting forth where in the record that evidence was entered in the record by the Examiner are attached to the end of this document.

X. RELATED PROCEEDINGS APPENDIX

An appendix containing copies of decisions rendered by a court or the Board in any proceeding identified above in Section (II) are attached to the end of this document.

XI. CONCLUSION

In view of the detailed discussion provided above regarding the pending rejections, Appellant respectfully submits that the bases for the rejections have been addressed and overcome, leaving the present application in condition for allowance. Therefore, Appellant respectfully requests the Board to reverse the Examiner's rejection of the pending claims.

If necessary, the Director of the USPTO is hereby is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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VIII. CLAIMS APPENDIX.

1. A liquid crystal display, comprising:

a memory storing, until a next time, current data indicating current brightness of each pixel provided in a liquid crystal panel;

a look-up table precedently storing (i) combinations of previous data and the current data, the combinations having possibilities to be inputted, and (ii) output signals corresponding to the respective combinations;

control means for outputting an output signal as corrected current data in order to facilitate grayscale transition from a previous time to a current time, by reading out, from the look-up table, data corresponding to a combination of previous data read out from the memory and current data, and outputting that data or that data after being interpolated, instead of the current data;

a heater heating the liquid crystal panel, the heater including a plurality of heater electrodes, each of the plurality of heater electrodes being formed as a linear band aligned to be in parallel with a side of the liquid crystal panel; and

heater control means for controlling start and stop of heating by the heater, in such a manner as to keep a sensed temperature of the liquid crystal panel to be not more than ±3°C of a predetermined target temperature which is within a range between 33°C and 63°C, the sensed temperature of the liquid crystal panel being determined by sensing a temperature of a plurality of separate sections of the liquid crystal panel.

2. The liquid crystal display as defined in claim 1, wherein, a number of the look-up table is one.

3. The liquid crystal display as defined in claim 1, wherein, the look-up table is arranged so as to correspond to the target temperature.

4. The liquid crystal display as defined in claim 1, wherein, the target temperature is determined to be within a range between 48°C and 63°C.

5. The liquid crystal display as defined in claim 2, wherein, the target temperature is determined to be within a range between 48°C and 63°C.

6. The liquid crystal display as defined in claim 1, wherein, the liquid crystal panel includes a liquid crystal cell in vertical align mode and is driven in normally black mode.

7. A liquid crystal display, comprising:

a memory storing, until a next time, current data indicating current brightness of each pixel provided in a liquid crystal panel;

a look-up table precedently storing (i) combinations of previous data and the current data, the combinations having possibilities to be inputted, and (ii) output signals corresponding to the respective combinations;

control means for outputting an output signal as corrected current data in order to facilitate grayscale transition from a previous time to a current time, by reading out, from the look-up table, data corresponding to a combination of previous data read out from the memory and current data, and outputting that data or that data after being interpolated, instead of the current data;

a heater heating the liquid crystal panel, the heater including a plurality of heater electrodes, each of the plurality of heater electrodes being formed as a linear band aligned to be in parallel with a side of the liquid crystal panel; and

heater control means for controlling the heater so as to either stop the heating by the heater when a sensed temperature of the liquid crystal panel exceeds a threshold value which is 1°C through 1.5°C higher than a target temperature, or start the heating by the heater when the sensed temperature of the liquid crystal panel goes below a threshold value which is 1°C through 1.5°C lower than the target temperature, the target temperature being determined in advance to be in a range between 33°C and 63°C; wherein

the sensed temperature of the liquid crystal panel is determined by sensing a temperature of a plurality of separate sections of the liquid crystal panel.

8. The liquid crystal display as defined in claim 7, wherein, a number of the look-up table is one.

9. The liquid crystal display as defined in claim 7, wherein, the look-up table is arranged so as to correspond to the target temperature.

10. The liquid crystal display as defined in claim 7, wherein, the target temperature is determined to be within a range between 48°C and 63°C.

11. The liquid crystal display as defined in claim 8, wherein, the target temperature is determined to be within a range between 48°C and 63°C.

12. The liquid crystal display as defined in claim 7, wherein, the liquid crystal panel includes a liquid crystal cell in vertical align mode and is driven in normally black mode.

13. A liquid crystal display, comprising:

a memory storing, until a next time, current data indicating current brightness of each pixel provided in a liquid crystal panel;

a look-up table precedently storing (i) combinations of previous data and the current data, the combinations having possibilities to be inputted, and (ii) output signals corresponding to the respective combinations;

control means for outputting an output signal as corrected current data in order to facilitate grayscale transition from a previous time to a current time, by reading out, from the look-up table, data corresponding to a combination of

previous data read out from the memory and current data, and outputting that data or that data after being interpolated, instead of the current data;

a heater heating the liquid crystal panel, the heater including a plurality of heater electrodes, each of the plurality of heater electrodes being formed as a linear band aligned to be in parallel with a side of the liquid crystal panel; and

heater control means for controlling start and stop of heating by the heater, in such a manner as to keep a difference between a sensed temperature of the liquid crystal panel and a target temperature to be not more than a predetermined threshold value, the target temperature being a temperature at which, by facilitating the grayscale transition by the control means, each pixel is virtually able to reach a desired grayscale level in every grayscale level transition,

the threshold value being set in such a manner as to keep a difference between a grayscale level at which a pixel reaches as a result of the grayscale level correction by the control means and a target grayscale level to be within an allowable range; wherein

the sensed temperature of the liquid crystal panel is determined by sensing a temperature of a plurality of separate sections of the liquid crystal panel.

14. The liquid crystal display as defined in claim 13, wherein, a number of the look-up table is one.

15. The liquid crystal display as defined in claim 13, wherein, the look-up table is arranged so as to correspond to the target temperature.

16. The liquid crystal display as defined in claim 13, wherein, the target temperature is determined to be within a range between 33°C and 63°C.

17. The liquid crystal display as defined in claim 14, wherein, the target temperature is determined to be within a range between 33°C and 63°C.

18. The liquid crystal display as defined in claim 13, wherein, the target temperature is determined to be within a range between 48°C and 63°C.

19. The liquid crystal display as defined in claim 14, wherein, the target temperature is determined to be within a range between 48°C and 63°C.

20. The liquid crystal display as defined in claim 13, wherein, the allowable range is such a range that an error between a target brightness and a brightness obtained as a result of the grayscale transition to the current time is not more than ±20%.

21. The liquid crystal display as defined in claim 14, wherein, the allowable range is such a range that an error between a target brightness and a brightness obtained as a result of the grayscale transition to the current time is not more than ±20%.

22. The liquid crystal display as defined in claim 13, wherein, the liquid crystal panel includes a liquid crystal cell in vertical align mode and is driven in normally black mode.

23. The liquid crystal display as defined in claim 1, wherein, the heater control means controls start and stop of heating by the heater irrespective of ambient temperature.

24. The liquid crystal display as defined in claim 1, wherein the heater control means comprises:

a plurality of temperature sensors, each of the plurality of temperature sensors being configured to sense the temperature of a separate section of the liquid crystal panel.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.

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